

# Strategic Highway Safety Plan for Vermont

## 5. Critical Strategies

To identify the critical strategies needed to achieve the goal of the SHSP, seven task teams were formed from individuals representing a variety of safety partners among the 4E's as was explained in Section 2.1. Between the months of April and August 2006, each task team was asked, to identify critical strategies based on data findings, and to prepare work plans for each of the strategies. As an initial starting point, the task teams reviewed the strategies listed in set of guides from the National Cooperative Highway Research Program (NCHRP) Report 500 series. Listed in Table 16 is the final set of critical strategies for each emphasis area.

**Table 16. Critical Strategies**

Keeping Vehicles on Roadway & Minimizing the Consequences of Leaving the Road	
<b>Objective</b>  Reduce the number of major crashes related to roadway departure by 5% by 2010 from 2003 levels.	Pilot program to implement low cost safety improvements on local roads systems
	Provide improved delineation in low visibility conditions
	Provide edgeline or centerline rumble stripes
	Improved advanced warning & delineation of unexpected changes in horizontal alignment
	Improve roadside geometry by eliminating shoulder drop-offs, and providing safer side slopes and ditches
	Improve clear zone by removing, relocating, shielding, or delineating roadside objects
Improving Young Driver Safety	
<b>Objective</b>  Reduce the number of major crashes involving young drivers by 19% by 2010 from 2003 levels.	Strengthen the VT Graduated Licensing Law for young drivers
	Improvements in initial drivers education and advanced skill training
	Improve parental accountability in young driver training and behavior
Improving The Design & Operation Of Highway Intersections	

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**Table 16. Critical Strategies**

<b><u>Objective</u></b>  Reduce the number of major crashes at intersections by 3% by 2010 from 2003 levels.	Improve Operation at intersections
	Improve visibility by providing enhanced signing and delineation
	Improved maintenance and visibility of signs and markings
	Improve Geometry at Intersections
	Implement physical changes on the approaches to and at intersections
	Improve driver compliance with traffic control devices and traffic laws at intersections through increased enforcement
	Reduce speed at intersections
	Public Awareness at High Accident Locations
	Local Program for Identifying and Prioritizing High Accident Intersections
Increasing Seat Belt Use	
<b><u>Objective</u></b>  Reduce the number of fatal crashes in which occupants suffering fatal injuries were unbelted by 10% by 2010 from 2003 levels.	Raise awareness of the importance of safety belt & the link to air bag effectiveness
	Enact a Standard Safety Belt Law
	Increased enforcement of traffic safety laws in Vermont
	Engage the Vermont business community in mitigation efforts
Reducing Impaired Driving	
<b><u>Objective</u></b>  Reduce the number of major crashes related	Improve the public awareness of impairment
	Create the Public Perception that DUI apprehension is likely

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**Table 16. Critical Strategies**

to alcohol by 30% by 2010 from 2003 levels.	
	Improve the public awareness of the consequences of impaired driving
	Create the Public Perception that Punishment Is Likely
<b>Curbing Speeding and Aggressive Driving</b>	
<b><u>Objective</u></b>	Create the public perception that punishment is likely
Reduce the number of major crashes involving aggressive driving by 19% by 2010 from 2003 levels.	Educating the public to why it is dangerous
	Create the public perception that apprehension is likely
	Improvements in the education of novice drivers
	Remedial driver education course
<b>Keeping Drivers Alert</b>	
<b><u>Objective</u></b>	Enact cell phone restriction legislation
Reduce the number of major crashes related to keeping drivers alert by 14% by 2010 from 2003 levels.	Install shoulder and/or centerline rumble strips
	Enhance effectiveness/awareness of safety rest stops
	Increase driver awareness of dangers associated with distractions while driving

## 5.1 Critical Strategy Work Plans

This section describes in detail in a work plan each of the critical strategies listed in the previous section. Each work plan contains information on the what, where, when, who and how of each strategy. Specifically, the work plans explains in general terms what should be done, the type(s) of crash targeted, the specific production output(s), which organizations will be involved, what the funding sources will be, the time frame for implementation and if needed, the type of data that should be collected, when should the data be collected, how much data collected, and how the data should be analyzed. The work plans are intended to provide a general road map towards the implementation of the strategies.

## **5.1.1 Keeping Vehicles on the Roadway & Minimizing the Consequences of Leaving the Road**

Based on the crash data, our task team chose to focus our strategies on 2-lane, 50 mph rural highways. A large number of run-off-road crashes involve striking trees, and to a lesser degree, other fixed objects. Vehicle overturning also occurs in a large percentage of run-off-road crashes. In order to minimize the consequences of leaving the roadway, we chose to focus on improving clear zones and improving side slopes, ditches, and shoulders. A disproportionate number of crashes happen in low light conditions, so several of our strategies focus on improving delineation of the roadway using signs, pavement markings, and rumble stripes. Because a large percentage of run-off-road crashes happen on town highways, we also developed a strategy for providing technical and financial assistance to municipalities to address high crash locations in their jurisdiction.

We concentrated on strategies that will be relatively easy to implement. Further safety improvements can and should be undertaken during highway reconstruction projects, such as providing wider travel lanes and shoulders, realigning curves, and adjusting vertical alignment to provide improved sight distance.

Obviously, a key to minimizing the consequences of a crash of any sort, and particularly of striking a fixed object or overturning, is for the vehicle's occupants to be wearing seatbelts. We chose not to write a strategy for this, because there is another task team devoted to this critical area. The crash data also showed that an alarming percentage of the crashes were alcohol related, but again, because there is a task team devoted to these issues we did not include reducing impaired driving in our strategies.

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<b>CEA 1</b>	<b>Keeping Vehicles on the Roadway and Minimizing the Consequences of Leaving the Road</b>
<b>Strategy 1</b>	<b>Develop a pilot program to implement low cost safety improvements along local road systems</b>
<b>Targets</b>	Run-off-road crashes on 50 mph 2-lane rural highways, especially crashes involving low visibility conditions, rollovers, and fixed objects.
<b>Implementation</b>	In towns with multiple high crash locations and a willingness to participate in data collection and funding.
<b>Time Frame</b>	Short term (1-2 years)
<b>Output</b>	Development of process for engaging towns to participate. Number of towns participating. Number of high crash locations treated. Report from participating towns on types strategies implemented.
<b>Outcome</b>	Reduction in targeted crashes
<b>Data Needed</b>	Towns with multiple high crash locations with targeted crash types.
<b>Data Collection</b>	VAOT's high crash location report.
<b>Funding</b>	VAOT High Risk Rural Roads program with local match.
<b>Agencies Involved</b>	VAOT, towns, Vermont Local Roads
<b>Measure of Performance</b>	Development of a process and number of participating towns
<b>Notes:</b>	<p><u>Sub-Strategies:</u> low cost safety improvements such as pavement markings, signs, brush cutting, removal of fixed objects from clear zone. Ongoing evaluation and potential expansion of program.</p> <p><u>Potential Roadblocks:</u> Local match. Initial implementation and follow through. (Time commitment, record keeping)</p> <p><u>Keys to Success:</u> Local buy-in, technical support from VAOT/VT Local Roads</p>

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**CEA 1**                      **Keeping Vehicles on the Roadway and Minimizing the Consequences of Leaving the Road**

**Strategy 2**                      **Provide improved delineation in low visibility conditions**

**Targets**                      Run-off-road crashes on 50 mph 2-lane rural highways, especially crashes involving low visibility conditions

**Implementation**                      On winding roads with narrow shoulders, wooded areas, or fog areas. Prioritize based on AADT and number of targeted crashes

**Time Frame**                      Short term (1-2 years)

**Output**                      Number of miles and locations treated

**Outcome**                      Reduction in targeted crashes

**Data Needed**                      Crash data to identify corridors with high numbers of run-off-road crashes. AADT information. Target roadway feature identification by towns and VAOT districts

**Data Collection**                      VAOT District, Highway Research, Traffic Research, and town public works staff

**Funding**                      VAOT Operations, VAOT Highway Safety Improvement Program, High Risk Rural Roads program with local match, local funding

**Agencies Involved**                      VAOT, towns

**Measure of Performance**                      Number of miles and locations treated

**Notes:**                      Sub-Strategies: Wider, brighter, more durable pavement markings  
Edge lines where non-existent  
Snowplowable raised pavement markers  
Post mounted delineators

Potential Roadblocks: funding, on-going maintenance of pavement markings

Keys to Success: Long term commitment to maintaining improvements

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**CEA 1**                      **Keeping Vehicles on the Roadway and Minimizing the Consequences of Leaving the Road**

**Strategy 3**                **Provide edgeline or centerline rumble stripes**

**Targets**                      Run-off-road crashes on 50 mph 2-lane rural highways, especially crashes involving low visibility conditions

**Implementation**        On roads with relatively wide paved shoulders and new pavement, away from residential areas. Prioritize based on AADT and number of targeted crashes

**Time Frame**                Short term (1-2 years)

**Output**                      Number of miles treated

**Outcome**                    Reduction in targeted crashes

**Data Needed**              Crash data to identify corridors with high numbers of run-off-road crashes. AADT information. Target roadway feature identification by towns and VAOT districts

**Data Collection**        VAOT District, Highway Research, Traffic Research, and town public works staff

**Funding**                      VAOT Operations, VAOT Highway Safety Improvement Program, High Risk Rural Roads program with local match, local funding

**Agencies Involved**        VAOT, towns

**Measure of Performance**    Number of miles treated

**Notes:**                      Potential Roadblocks: funding, noise concerns, safety concerns for bicycles and motorcycles, additional effort (cleaning) prior to repainting

Keys to Success: Long term commitment to maintaining improvements

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**CEA 1**                      **Keeping Vehicles on the Roadway and Minimizing the Consequences of Leaving the Road**

**Strategy 4**                      **Provide improved advanced warning and delineation of unexpected changes in horizontal alignment**

**Targets**                      Run-off-road crashes on 50 mph 2-lane rural highways, on curves

**Implementation**                      On curves with limited advanced sign distance and curves requiring at least 10 mph reduction in speed to safely negotiate. Prioritize based on AADT and number of targeted crashes

**Time Frame**                      Short term (1-2 years)

**Output**                      Number of curves treated

**Outcome**                      Reduction in targeted crashes

**Data Needed**                      Crash data to identify curves with high numbers of run-off-road crashes. AADT information. Target curve feature identification by towns and VAOT districts

**Data Collection**                      VAOT District, Highway Research, Traffic Research, and town public works staff

**Funding**                      VAOT Operations, VAOT Highway Safety Improvement Program, High Risk Rural Roads program with local match, local funding

**Agencies Involved**                      VAOT, towns

**Measure of Performance**                      Number of curves treated

**Notes:**                      Sub-Strategies: Signs (chevrons, arrows, supplemental advisory speed plaques, dynamic warning, high visibility sheeting)  
Pavement markings (edge lines, centerlines, advance warning text/symbols, dynamic striping)  
Post mounted delineators

Potential Roadblocks: funding, on-going maintenance of pavement markings and signs

Keys to Success: Long term commitment to maintaining improvements



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**CEA 1**                      **Keeping Vehicles on the Roadway and Minimizing the Consequences of Leaving the Road**

**Strategy 5**                **Improve roadside geometry by eliminating shoulder drop-offs, and providing safer side slopes and ditches**

**Targets**                      Roll-over crashes on 50 mph 2-lane rural highways

**Implementation**        On roads with deficient shoulder drop-offs, side slopes, and ditches. Prioritize based on AADT and number of targeted crashes. Target sections that are scheduled for rehabilitation or reconstruction regardless of crash history

**Time Frame**                medium term (3-5 years)

**Output**                      Number of locations treated

**Outcome**                    Reduction in targeted crashes

**Data Needed**              Crash data to identify corridors with high numbers of roll-over crashes. AADT information. Target roadway feature identification by towns and VAOT districts

**Data Collection**        VAOT District, Highway Research, Traffic Research, and town public works staff

**Funding**                    VAOT Operations, VAOT Highway Safety Improvement Program, High Risk Rural Roads program with local match, local funding

**Agencies Involved**        VAOT, towns

**Measure of Performance**    Number of locations treated

**Notes:**                      Sub-Strategies: Raise shoulders with gravel or grindings  
Use molding shoe to get angled edge on new pavement  
Extend toe of slope to reduce angle.  
Extend pipes on drainage inlet to reduce depth of ditch.  
Use stone in ditches to reduce depth of ditch.

Potential Roadblocks: funding, environmental and right-of-way constraints

Keys to Success: Long term commitment to maintaining improvements

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**CEA 1**                      **Keeping Vehicles on the Roadway and Minimizing the Consequences of Leaving the Road**

**Strategy 6**                **Improve clear zone by removing, relocating, shielding, or delineating roadside objects**

**Targets**                      Fixed-object crashes on 50 mph 2-lane rural highways

**Implementation**        On roads with deficient clear zones. Prioritize based on AADT and number of targeted crashes. Remove/relocate object where possible, otherwise shield or delineate. Target sections that are scheduled for rehabilitation, reconstruction, or utility relocation regardless of crash history

**Time Frame**                Medium term (3-5 years)

**Output**                      Number of locations treated

**Outcome**                    Reduction in targeted crashes

**Data Needed**              Crash data to identify sections with high numbers of fixed-object crashes. AADT information. Target roadway feature identification by towns and VAOT districts

**Data Collection**        VAOT District, Highway Research, Traffic Research, and town public works staff

**Funding**                    VAOT Operations, VAOT Highway Safety Improvement Program, VAOT Projects, High Risk Rural Roads program with local match, local funding

**Agencies Involved**        VAOT, towns, utility companies

**Measure of Performance**    Number of locations treated

**Notes:**                      Sub-Strategies: Remove/relocate fixed objects from clear zone

Relocate utility poles (install underground utilities, move utility poles to inside of curves, relocate outside clear zone)

Install breakaway features on fixed objects that must remain in clear zone (such as mailboxes, light poles, sign posts)

Implement local zoning rules to establish safe setbacks for fixed objects outside highway right-of-way

Shield fixed objects (guardrail, embankments, crash attenuators)

Delineate fixed objects (reflective bands on utility poles and trees, reflective strips on posts/roadside hardware, post mounted object markers, reflective collars for moose, delineate existing guardrail ends, repair and maintain in-guardrail reflectors)

Potential Roadblocks: funding; historical, environmental and right-of-way constraints

Keys to Success: Long term commitment to maintaining improvements

## 5.1.2 Improving Young Driver Safety

Young drivers (ages 15-21) are involved in higher rates of motor vehicle crashes than most other age groups. The emotional and financial effects of injury or fatality crashes for persons in this age group are particularly tragic.

The data on young driver crashes includes some patterns that led our task team to its strategies for improvement:

- Young drivers often have young passengers who are also injured or killed
- Young drivers may not have fully learned or mastered the habits and skills of experienced drivers that allow them to avoid or mitigate a crash
- Distractions may reduce the focus of young drivers on the dynamic environment where they are driving
- Crashes in the late night hours are more likely to involve a young driver
- Safety belts and airbags are effective safety devices when a crash occurs. Sadly, young drivers in serious crashes are less likely than the population as a whole to be belted when a crash occurs

Vermont has already had some success with establishing a Graduated Drivers License (GDL) statute. The goal of a GDL is to support the transition from non-driver to safe and experienced driver. The statute contains provisions that work to minimize the consequences of mistakes or inexperience that are a natural part of the learning to drive process. Our task team believes that the current GDL can be strengthened in ways that will reduce the devastating effects of young driver crashes.

Most young Vermonters attend a Driver's Education course at their local high school or through a private driving academy. These programs are a key in providing the foundation level of skills and understandings about safe driving practices. We need to assure that the delivery of this training is consistent and well focused statewide. We also need to provide safe and structured opportunities for beginning drivers to sharpen the skills they will need when something unexpected happens on the road.

The role of parents in helping their young family members to establish safe driving behaviors is another opportunity for improvement. Parents need to create an expectation of safety and responsibility with consequences when that expectation is not fulfilled. Providing the tools for parents to understand both their options and their obligations in this area is another part of the keeping their kids safe.

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<b>CEA 2</b>	<b>Improving Young Driver Safety</b>
<b>Strategy 1</b>	<b>Strengthen the VT Graduated Licensing Law for young drivers</b>
<b>Targets</b>	Young drivers, predominantly in the 16-18 year old age range
<b>Implementation</b>	This strategy will require action by the VT legislature along with follow up initiatives in education and law enforcement
<b>Time Frame</b>	Short Term (2 years) for legislative change; Four to nine years for change monitoring
<b>Output</b>	New language would be added to the existing GDL legislation to achieve: Restrictions on passengers in cars driven by young drivers- Night time driving limitations for young drivers - Primary safety belt enforcement through age 18- No cell phone use (including hands free phones) through age 18
<b>Outcome</b>	<p>By 2010, reduce the percentage of nighttime (10 pm to 2 am) and early morning (2 am to 6 am) crashes involving drivers &lt;21 years to a rate not higher than the annual average for all drivers (for 2003, nighttime = 12.3% vs 6.5% and early morning = 6.0% vs 3.6%).</p> <p>By 2010, reduce from over 25% to less than 15%, the number of 16-18 year old drivers in major crashes who were not restrained with a safety belt.</p> <p>By 2010, monitor and report the number of major crashes involving cell phone use by drivers &lt;21 years.</p> <p>If the combined effects of the proposed strategy produced a modest decrease of 15 major crashes per year with one fatality and 14 disabling injuries, the annual savings would be over \$1,800,000.</p>
<b>Data Needed</b>	Existing Vermont Crash data relating to the crash types and interventions addressed; A new Crash Data element specifically monitoring cell phone involvement with crashes; Better data integration of Crash data and health data to monitor more closely the severity, health outcomes, and health costs of crashes addressed in this strategy
<b>Data Collection</b>	Ongoing at present through the existing Crash data system
<b>Funding</b>	For GDL legislation changes (none); For addition of a Crash data element monitoring cell phone use ( <i>undetermined at this time</i> ); For GDL education and enforcement (no specific new funding- to be integrated with existing expenditures)
<b>Agencies Involved</b>	The Highway Safety Community including health, law enforcement, education, engineering, insurance, and other stakeholders as advocates for GDL improvements; The VT legislature acting to pass legislation; The law enforcement community, acting to assure that the laws are enforced; The education, health care, and young peer communities to teach young drivers about the importance of the GDL changes; The Vermont Department of Health, the Agency of Transportation, and the University of Vermont for improvements in data analysis regarding injury severity and injury costs. Young drivers and representative groups such as Students Against Drunk Driving to provide input on what influences young driver choices.
<b>Measure of Performance</b>	Changes to the existing VT Graduated Licensing law; Crash reductions related to the outcomes described

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**Notes:**

There are a variety of enhancements to the VT Graduated Licensing law that should be considered through the legislative process. There are arguments in favor and against the various possibilities for strengthening the law. Consensus will need to be built among all stakeholders including young drivers for success with this strategy

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<b>CEA 2</b>	<b>Improving Young Driver Safety</b>
<b>Strategy 2</b>	<b>Reduce young driver crashes through improvements in the education of young drivers via both initial drivers education and advanced skill training</b>
<b>Targets</b>	Young drivers, in the 16-18 year old age range
<b>Implementation</b>	Implementation of a uniform driver education curriculum with common educational standards for use in VT schools and widespread increased offerings of advanced driver courses for young drivers. Public and private Driver Educators will need to build consensus on best practices for the curriculum and effective strategies for teaching safe driving habits and skills. Insurers, Driver Educators, and other behavioral scientists must reach consensus on the role of both initial driver education courses and advanced driver skills training in improving young driver safety. Mechanisms to assure access to both initial driver education and advanced driver skills training must be assured
<b>Time Frame</b>	Medium (3 to 5 years). By 2010, have a standardized driver education curriculum with common educational standards in place for all Vermont High Schools as well as a standardized advanced skill training available to all young drivers
<b>Output</b>	Standardized driver education curriculum with common educational standards provided by the VT Dept of Education; Standardized advanced driver skill training available to all young drivers through private trainer sources
<b>Outcome</b>	The effect of this strategy will be to reduce crashes in the 16-18 year age group by improving the safety habits and foundation knowledge of this group regarding safe driving practices and their importance for health, safety, and financial reasons; and by improving the skill abilities of young drivers to avoid crashes while safely building driver experience tenure
<b>Data Needed</b>	Ongoing monitoring of VT Crash Data tracking factors related to driver inexperience or lack of developed driver skills; Standardized measurement of achieving drivers education competencies; Standardized measurement of achieving skill competencies; Crash rate comparisons for driver's who have achieved educational competencies and those who have not yet achieved educational competencies
<b>Data Collection</b>	The VT Crash Data system; The Dept of Education and private providers of driver education to gather and report the achievement of standardized young driver competencies
<b>Funding</b>	The costs of standardizing driver education and driver skill competency education have not yet been determined; The costs of measuring driver competency achievement have not yet been determined; The costs of driver education delivery are currently budgeted in public schools and private skill courses are supported by student fees and reduced insurance premiums
<b>Agencies Involved</b>	VT Dept of Education (curricula and measuring driver achievement); VT Agency of Transportation (Crash system monitoring); Private Driver Educators (curricula and measuring driver achievement); Insurers (monitoring the effects of public and private driver education); Behavioral scientists (pediatricians, behavioral researchers, child life specialists, etc.) and other injury prevention experts to assist in determining what forms of learning are most closely associated with improved driver performance and reductions in crash rates for young drivers. Young drivers and representative groups such as Students Against Drunk Driving to provide input on how young drivers learn

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**Measure of Performance**

A standardized driver education curriculum in use throughout VT High Schools; A standardized driver skill curriculum in use by private driving instruction programs; Common measurement tools for determining achievement of young drivers being prepared in both public and private settings; Increase participation by young drivers in advanced skill training programs; Reductions in crashes related to driver inexperience

**Notes:**

It is difficult to isolate and measure the specific effects of initial driver education training in public schools and through private agencies. This strategy relies upon an assumption that initial driver education is provided as a means of building appropriate knowledge, foundation skills, habits and outlooks for safe driving. The strategy acknowledges that it is likely beyond the capabilities of public driver education to provide training in the skills necessary for young drivers to avoid crashes in high stress situations and that this more specialized training can be provided in a private/commercial settings.

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<b>CEA 2</b>	<b>Improving Young Driver Safety</b>
<b>Strategy 3</b>	<b>Improve parental accountability in young driver training and behavior</b>
<b>Targets</b>	The parents of young drivers, in the 16-20 year old age range
<b>Implementation</b>	Strengthen the participation of parents in improving young driver skills, habits, and operations of a motor vehicle by the following means: The Department of Education and DMV should produce a simplified brochure that explains the VT Graduated Licensing statute; Drivers educators should improve the documentation of parental supervised driving experience leading to successful driver education course completion; The DMV should establish a permanent database of parental approval for young drivers and inform parents of their ability to have graduated licenses removed; Drivers educators should have a mandatory parental orientation as a component of successful completion of a driver education course
<b>Time Frame</b>	Medium term (3-5 years)
<b>Output</b>	DMV Graduated licensing brochure; Documentation of parental supervised driving instruction as a component of successful completion of public driver education courses; DMV capture of parental approval for graduated driver licenses and affirmative information for parents on their ability to remove graduated licenses; Parental orientations as a mandatory component of successful completion of public driver education courses
<b>Outcome</b>	A better understanding by parents about their roles in young driver preparation and safe operations. Increased parental participation in young driver safety and development of safe driving practices.
<b>Data Needed</b>	Documentation of parent supervised driver training; Documentation of parent approval for holding a graduated drivers license; Documentation of parent attendance at mandatory orientation sessions
<b>Data Collection</b>	Schools for documentation of parent supervised driving experience and attendance at the mandatory orientation sessions; DMV for parental approval to hold a graduated drivers license
<b>Funding</b>	Current funding is provided by the Governor's Highway Safety Program and the VT Department of Education for production and distribution of an updated GDL brochure; A funding source and costs would need to be identified for the construction of a database documenting parent supervised driver training and parental attendance at mandatory orientation sessions; Funding and costs would need to be identified for DMV to capture the approval by parents for young drivers to hold a GDL
<b>Agencies Involved</b>	Department of Education; Department of Motor Vehicles; Public High Schools providing driver education courses; Private driver education instructors. Family groups that include parents and young drivers to provide input on how to involve parents as partners in protecting young drivers.
<b>Measure of Performance</b>	Construction and population of the databases; Parental participation in young driver preparation and mandatory orientation sessions; Parents exercising removal of graduated licenses
<b>Notes:</b>	This strategy is an infrastructure initiative aimed at improving the overall system of



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young driver preparation and accountability through the involvement of parents as stakeholders in young driver safety. The specific effects of this initiative on crash rates will be difficult to determine so measures of performance have been targeted at monitoring parental participation

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## 5.1.3

### Improving the Design and Operation of Highway Intersections

Our task team concentrated on strategies that would be easy to implement and relatively low cost. We focused our strategies on making intersections safer by changing the operational characteristics of the intersection and improving visibility by enhanced signing and delineation, and through the use of low cost signing/pavement markings.

Additional strategies that should be implemented at particular intersections during reconstruction projects and whenever possible, include realignments, driveway closures and relocations, as well as roundabout solutions. Our task team also included work plans involving education, enforcement, and outreach programs to address our targeted crashes.

Because a large percentage of the strategies most likely will be implemented by municipalities, our task team developed strategies to provide technical, financial, and educational assistance for implementation.

Finally, our data also showed that alcohol related crash were of an alarming proportion, almost doubled of that for all crashes during the data collection period. Since there is a task team specifically addressing reducing impaired driving strategies we did not address this area but felt it to be warranted of mention.

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<b>CEA 3</b>	<b>Improving the Design and Operation of Highway Intersections</b>
<b>Strategy 1</b>	<b>Improve Operation at intersections</b>
<b>Targets</b>	Crashes that occur at stop controlled, higher volume, t-intersections (right angle broadside, right turns involving pedestrians, and left turns where other options are safer)
<b>Implementation</b>	Intersections would be prioritized based on crash history and where targeted crash types can be affected
<b>Time Frame</b>	Short Term (1 to 2 years)
<b>Output</b>	Outputs would be measured by the number of intersections treated
<b>Outcome</b>	Reduction in targeted crashes
<b>Data Needed</b>	Crash history/crash type; Speed limits and actual speeds on approaches; AADT/turning movements; Existing markings and signs
<b>Data Collection</b>	Existing VAOT crash and traffic data; Additional speed data through VAOT traffic count program; Speed data from speed carts; RPC data collection
<b>Funding</b>	High risk rural roads with local match, HSIP, VAOT scheduled projects, local projects, local or AOT maintenance funds
<b>Agencies Involved</b>	VAOT, RPC's, local municipalities
<b>Measure of Performance</b>	Treated number of intersections
<b>Notes:</b>	<p><u>Sub-Strategies:</u> Restrict/eliminate turn maneuver To provide all way stop control where appropriate Post advisory speed limits</p> <p><u>Keys to Success:</u> Proper maintenance of the strategies implemented will be important to the overall success. Presence of snow or ice on the roadway may significantly reduce the strategy's effectiveness at critical times. Proper training of locals in MUTCD requirements and state standards for identify and implementing the appropriate strategies will be necessary.</p> <p><u>Potential Roadblocks:</u> Staffing/expertise, prioritizing for locals, funding</p>

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## CEA 3                      Improving the Design and Operation of Highway Intersections

### Strategy 2              **Improve visibility by providing enhanced signing and delineation**

**Targets**                      Crashes that occur at stop controlled, higher volume, t-intersections, with patterns of rear end, right angle or turning collisions related to lack of driver awareness of the presence of the intersection

**Implementation**        Intersections would be prioritized first at intersection where no markings or signs exist and based on crash history where targeted crash types can be affected

**Time Frame**                Short Term (1 to 2 years)

**Output**                      Outputs would be measured by the number of intersections treated

**Outcome**                    Reduction in targeted crashes

**Data Needed**              Crash history/crash type; Speed limits and actual speeds on approaches; AADT/turning movements; Inventories of existing markings & signs; Reflectivity and durability

**Data Collection**          Existing VAOT crash and traffic data, sign inventory; Additional speed data through AOT traffic count program; Speed data from speed carts; RPC data collection; Local municipalities; VAOT personnel to supply reflectivity & durability data.

**Funding**                      High risk rural roads with local match, HSIP, VAOT scheduled projects, local projects, local or VAOT maintenance funds

**Agencies Involved**        VAOT, RPC's, and local municipalities

**Measure of Performance**    Treated number of intersections

**Notes:**                      Sub-Strategies:  
Signs and markings where none currently exist.  
Brighter and or larger/wider signs and markings.  
Provide stop bar on side road approach.  
Supplemental pavement markings & signs.  
Provide lane assignment with signs and markings.

Keys to Success:    Proper maintenance of the strategies implemented will be important to the overall success. Presence of snow or ice on the roadway may significantly reduce the strategy's effectiveness at critical times. Proper training of locals in MUTCD requirements and state standards for identify and implementing the appropriate strategies.

Potential Roadblocks:    Staffing/expertise, prioritizing for locals, funding

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<b>CEA 3</b>	<b>Improving the Design and Operation of Highway Intersections</b>
<b>Strategy 3</b>	<b>Improved maintenance and visibility of signs and markings</b>
<b>Targets</b>	Crashes that occur at stop controlled, higher volume, t-intersections, with patterns of rear end, right angle or turning collisions related to lack of driver awareness of the presence of the intersection
<b>Implementation</b>	Intersections would be prioritized based on crash history and where targeted crash types can be affected
<b>Time Frame</b>	Intersections would be prioritized based on crash history and where targeted crash types can be affected
<b>Output</b>	Outputs would be measured by the number of intersections treated
<b>Outcome</b>	Reduction in targeted crashes
<b>Data Needed</b>	Crash history/crash type; Speed limits and actual speeds on approaches; AADT/turning movements; Inventories of existing markings & signs; Location, type, & condition of signs/markings, Visually inspect for visibility/sight distance, Reflectivity and durability of existing signs & markings
<b>Data Collection</b>	Existing VAOT crash and traffic data, sign inventory; Additional speed data through VAOT traffic count program; Speed data from speed carts; RPC data collection; Local municipalities; VAOT personnel (Reflectivity and durability readings)
<b>Funding</b>	High risk rural roads with local match, HSIP, AOT scheduled projects, local projects, local or AOT maintenance funds
<b>Agencies Involved</b>	VAOT, RPC's, and local municipalities
<b>Measure of Performance</b>	Treated number of intersections
<b>Notes:</b>	<p><u>Sub-Strategies:</u></p> <ul style="list-style-type: none"><li>Timely replacement of knocked down signs</li><li>Thinning and clearing brush/trees for sight improvement</li><li>Replacement of faded and outdated signage and markings</li><li>Evaluate existing location of signs and change as needed</li><li>Install larger and or brighter signage and markings</li><li>Install advanced warning with markings and signs</li></ul> <p><u>Keys to Success:</u> Proper maintenance of the strategies implemented will be important to the overall success. Presence of snow or ice on the roadway may significantly reduce the strategy's effectiveness at critical times. Proper training of locals in MUTCD requirements and state standards for identify and implementing the appropriate strategies.</p> <p><u>Potential Roadblocks:</u> Staffing/expertise, prioritizing for locals, and funding</p>

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<b>CEA 3</b>	<b>Improving the Design and Operation of Highway Intersections</b>
<b>Strategy 4</b>	<b>Improve Geometry at Intersections</b>
<b>Targets</b>	Crashes that involve right angle, left turns, and rear end crashes
<b>Implementation</b>	Intersections would be prioritized where crash history indicates that improvements would result in safer and more efficient operations
<b>Time Frame</b>	Medium (3 to 5 years) to long term (5+ years) strategies due to design, review, and funding processes. Ongoing evaluations of high crash locations should be priority and those concurrent with roadway projects in design
<b>Output</b>	Outputs would be measured by the number of high crash locations treated
<b>Outcome</b>	Reduction in targeted crashes
<b>Data Needed</b>	Crash history/crash type; Existing intersection geometry; Anecdotal reporting of complex intersection geometries, problem areas
<b>Data Collection</b>	VAOT's high crash location report, VAOT district, RPC's, local DPW staff
<b>Funding</b>	HSIP; project process – VAOT scheduled projects and local projects; Developers – impact fees
<b>Agencies Involved</b>	VAOT, local municipalities, District Environmental Commissions, and local review boards.
<b>Measure of Performance</b>	Reduction in targeted crashes
<b>Notes:</b>	<p>Development of process for reviewing projects in design to address target locations. Development of review process for new Act 250 applications/local permitting to incorporate off-site improvements at high crash locations or locations which may deteriorate as a result of increased traffic volumes.</p> <p><u>Keys to Success:</u> Educate/heighten awareness of project designers/development review entities in order to implement safety improvements in existing/proposed projects.</p> <p><u>Potential Roadblocks:</u> Staffing at both State and local level; prioritizing for locals; funding. ROW and environmental permitting</p>

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<b>CEA 3</b>	<b>Improving the Design and Operation of Highway Intersections</b>
<b>Strategy 5</b>	<b><u>Implement physical changes on the approaches to and at intersections</u></b>
<b>Targets</b>	Higher volume, T-intersections, high crash areas. Crash types targeted by this strategy include those involving excessive speed, those involving bicyclists or pedestrians, those involving non-compliance with Stop signs, those involving driveway turning movements (right angle crashes)
<b>Implementation</b>	This strategy will be implemented first at intersections with larger than average numbers of the type of crash identified above
<b>Time Frame</b>	Because this strategy involves some minor construction that is more than signs and pavement markings, the time frame for implementation may be slightly more than a minor improvement. However, these would still be considered relatively minor impact projects and could be implemented fairly quickly. It is estimated that they could be done within two years.
<b>Output</b>	Implement these improvements at the top 5 intersections with these targeted crash types within two years. Address the top 20 intersections within 5 years.
<b>Outcome</b>	Reduction in targeted crashes
<b>Data Needed</b>	Need to analyze crash data to pull out unsignalized intersection crashes where speed or non-compliance with stop signs, driveway turning movements or bicyclists and pedestrians were involved. These need to be compiled by location and ranked according to prevalence of this type of crash.
<b>Data Collection</b>	Use existing crash reports. Not sure whether this amount of detail exists in generally collected data or whether individual reports will need to be reviewed. Could use RPCs or municipal law enforcement to identify intersections where these crash types are known to be prevalent.
<b>Funding</b>	These improvements could be undertaken as a component of a larger transportation project. Transportation Enhancement or Safe Routes to School funding could be used for bicycle or pedestrian facilities. Municipalities could fund projects on local roads. Could use HSIP funds.
<b>Entities Involved</b>	VAOT, RPCs, Municipalities
<b>Measure of Performance</b>	Treated number of intersections
<b>Notes:</b>	<p><u>Physical changes may include:</u> Driveway closures/relocation (access management) in the vicinity of intersections; Installations of islands on minor-road approach to intersection; Provision of appropriate pedestrian and/or bicycle facilities to reduce motorist/non-motorist conflict; Installation of rumble strips on approaches</p> <p><u>Keys to Success:</u> Educate/heighten awareness of project designers in order to implement safety improvements in existing projects.</p> <p><u>Potential Roadblocks:</u> Data may be difficult to pull out from crash reports to identify intersections with this type of crash. Access management is sometimes difficult to negotiate with affected property owners. Noise created by rumble strips is</p>

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sometimes unacceptable to neighboring property owners. Transverse rumble strips can be unpopular with cyclists/motorcyclists. To implement these changes as standalone projects will require that funding be dedicated to them among numerous other priorities. It will require staff and time to pull the data together to identify these intersections and then will require some engineering work to design the solutions

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<b>CEA 3</b>	<b>Improving the Design and Operation of Highway Intersections</b>
<b>Strategy 6</b>	<b><u>Improve driver compliance with traffic control devices and traffic laws at intersections through increased enforcement</u></b>
<b>Targets</b>	Crashes that occur on rural road, 2 lane, T intersections involving right angle and turning collisions
<b>Implementation</b>	Identify intersections with a combination of high stop sign violation rates, excessive speeds and related crash patterns
<b>Time Frame</b>	Short term (1 to 2 years) with available enforcement, problems could be addressed immediately
<b>Output</b>	Outputs would be measured by the hours of targeted enforcement
<b>Outcome</b>	Reduction in targeted crashes
<b>Data Needed</b>	Crash data (contributing factors including excessive speed, failure to comply with traffic control devices). Anecdotal evidence of problem areas
<b>Data Collection</b>	VAOT crash database; VAOT district, municipal, law enforcement knowledge
<b>Funding</b>	Need to provide for increase enforcement staff hours and vehicle operating cost. GHSP/NHTSA grants, municipalities, HSIP
<b>Entities Involved</b>	Local and state police, VAOT, and local municipalities
<b>Measure of Performance</b>	Hours of targeted enforcement
<b>Notes:</b>	<p><u>Potential Roadblocks:</u> Increased enforcement may divert police office from other priorities. Officer time to appear in court. Some localities have political issues with enforcement. Court system backlogs</p> <p><u>VT's Business Community:</u> Involving Vermont's business groups and organizations before implementation will give businesses an "ownership" position in the implementation of this highway safety strategy that will impact their employee's workplace, which may be essential in achieving public policy support for the strategy.</p>

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<b>CEA 3</b>	<b>Improving the Design and Operation of Highway Intersections</b>
<b>Strategy 7</b>	<b><u>Reduce speed at intersections</u></b>
<b>Targets</b>	Crashes that occur on rural road, 2 lane, T intersections involving right angle and turning collisions
<b>Implementation</b>	To identify intersections with excessive speeds and related crash patterns
<b>Time Frame</b>	Short (1 to 2 years) to medium (3 to 5 years) term depending on project type
<b>Output</b>	Outputs would be measured by the numbers of intersections treated
<b>Outcome</b>	Reduction in targeted crashes
<b>Data Needed</b>	Crash data (contributing factor including excessive speed). Anecdotal evidence of the problem areas
<b>Data Collection</b>	VAOT crash database, VAOT district, municipal, and law enforcement knowledge
<b>Funding</b>	These improvements could be undertaken as a component of a larger transportation project. Transportation Enhancement or Safe Routes to School funding could be used for bicycle or pedestrian facilities. Municipalities could fund projects on local roads. Could use HSIP funds. Development impact fees
<b>Entities Involved</b>	AOT, municipalities, Local and state police
<b>Measure of Performance</b>	Treated number of intersections
<b>Notes:</b>	<u>Potential Roadblocks:</u> Funding, staffing, “traffic calming” buy in, noise issues for rumble strips, and motorcycle/bicycle issues with rumble strips could present challenges

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<b>CEA 3</b>	<b>Improving the Design and Operation of Highway Intersections</b>
<b>Strategy 8</b>	<b>Public Awareness at High Accident Locations</b>
<b>Targets</b>	Crashes whether rear end or right angle broadside crashes are hoped to be reduced by alerting the everyday motorists to the issues surrounding a given intersection
<b>Implementation</b>	This strategy will be implemented by state and local governments at intersections that experience the highest 10 % for accident rates
<b>Time Frame</b>	This would include minor projects that could be implemented within a year
<b>Output</b>	PSA announcements are run in local newspapers, on local radio and television stations
<b>Outcome</b>	Reduce crashes at targeted intersections through heightened public awareness
<b>Data Needed</b>	Crash data will be required for the various intersections. This data will be collected from the Department of Motor Vehicles and local police department data bases
<b>Data Collection</b>	VAOT and local police department databases
<b>Funding</b>	Vermont state safety funds?
<b>Entities Involved</b>	VAOT, RPCs, Municipalities, local newspapers, local radio stations and local television stations
<b>Measure of Performance</b>	Treated number of intersections
<b>Notes:</b>	<p><u>Keys to Success:</u> Obtaining the most complete accident histories of the intersections included in the analysis.</p> <p><u>Potential Roadblocks:</u> Intersections may be perceived as problems but no documented accident histories exist. Given the relatively light traffic volumes on many Vermont roads, obtaining meaningful results may be difficult. Also, if other signing, marking or geometric changes are made the effectiveness of the public awareness campaign will be hard to measure</p>

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<b>CEA 3</b>	<b>Improving the Design and Operation of Highway Intersections</b>
<b>Strategy 9</b>	<b><u>Local Program for Identifying and Prioritizing High Accident Intersections</u></b>
<b>Targets</b>	This strategy does not by itself target particular crashes, however it seeks to assist communities in identifying the areas where extra attention is needed to the roadway environment
<b>Implementation</b>	This strategy will be implemented by local governments at intersections under their control
<b>Time Frame</b>	Implementation of the process: Short Term (1 to 2 years). This strategy will focus on minor project which can be constructed in a 3-9 month period. If major projects are required to mitigate the problem(s), then the town would work with the Regional Planning Commission to begin the project process
<b>Output</b>	Towns and villages develop programs to identify problem areas within their jurisdictions
<b>Outcome</b>	Reduce crashes at targeted intersections
<b>Data Needed</b>	Crash data will be required for the various intersections. This data will be collected from the Department of Motor Vehicles and local police department data bases. It is critical that accident reports are thorough
<b>Data Collection</b>	VAOT and local police department databases
<b>Funding</b>	Local Roads Program, RPC planning funds
<b>Entities Involved</b>	VAOT, RPC's, Municipalities (Public Works and Police Departments)
<b>Measure of Performance</b>	If the municipality produces a prioritized list of high accident locations within six months and a counter measure implementation plan be in place in another three months
<b>Notes:</b>	<p><u>Keys to Success:</u> It is critical that the community places a high value on safety and assigns someone to coordinate the effort for the town. Complete and accurate accident data is also important.</p> <p><u>Potential Roadblocks:</u> Incomplete accident data may not back up perceived high accident areas</p>